OIPE JC17
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PATENT & TRADEMARK OFFICE

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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
KARSTEN REIHS, ET AL.	: EXAMINER: BISSETT
SERIAL NO: 09/869,123	:
FILED: OCTOBER 3, 2001	: GROUP ART UNIT: 1711
FOR: ULTRAPHOBIC SURFACE	:

DECLARATION UNDER 37 CFR 1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Now comes Dr. Karsten Reihs, who deposes and states that:

1. I am a graduate of the University of Gottingen and received my PhD degree in Physical Chemistry in the year 1989.

2. I have been employed in the field of Surface Science since 1989, and I am currently Director of Science and Technology of Sunyx GmbH.

3. The following information is being provided for clarification in response to questions raised by the Examiner in the present application regarding the data presented in my earlier Declaration.

The data of Examples 1, 7, 8 and 10 of the Clark reference (U.S. Patent 5,674,592) were used to calculate the topography of surfaces consisting of nanostructure elements according to Clark as embodied in the S integral value as used in the present invention. In particular, the data used were the height of the nanostructure elements, the tip diameter of the nanostructure elements and the areal number densities of the nanostructure elements. These

were the same data used in calculating the value of the S integral in the examples of the present application. The calculations were performed with 262,144 points per calculation. This number of points per calculation is more than adequate to model the topography accurately.

The resulting height profiles were processed in exactly the same manner as described in the present application at page 14, lines 23-27; page 25, lines 1-22 and page 29, lines 6-19, and as described in my previous Declaration. No manipulation of the data was required or performed in order to calculate the S integral value. The calculations were performed in exactly the same manner as the examples in the present application using exactly the same type of data.

For the Examiner's information, the number m=n=512 points in both x and y directions was used, since it matches the number of points in the x and y directions of the height profiles in the examples of the present application (see, for example, page 28, line 1 to page 29, line 4). Accordingly this choice of the number of points in each of the x and y directions was chosen to make the results calculated in the examples of the present application and those calculated based upon the data in Clark be directly comparable.

With respect to the hydrophobic substance modeled in the calculations reported in my previous Declaration: In the Clark patent, the hydrophobic substance $C_8H_{17}(CH_2)_{11}SH$ on smooth gold consists of a contact angle of $\Theta_a = 125°$ (advancing contact angle Θ_a) and $\Theta_r = 105°$ (receding contact angle Θ_r) (see Table 2, example 3 of Clark) Since the contact angle hysteresis $\Delta\Theta = \Theta_a - \Theta_r = 20°$ is small, one can approximate the apparent contact angle Θ (or equilibrium contact angle) according to the well known equation $\Delta\Theta \sin\Theta = \cos\Theta_r - \cos\Theta_a$ (see e.g. J. Kijlstra et al, Colloids and Surfaces 206, 521 (2002)) yielding $\Theta = 116°$. The model used in the Declaration thus implies an apparent contact angle of a smooth gold coated surface of $\Theta = 115°$ as seen from example 6 in the specification. Thus the model used in the

Declaration corresponds to a hydrophobic coating equivalent to the compound used in the Clark patent.

Accordingly, as shown in Table 1 of my earlier Declaration (a copy of which is attached to the present Declaration), no additional information was needed beyond the information provided by Clark and the model used in the present invention to carry out the calculations and verify that even though Clark shows a contact angle larger than 170°, the surfaces provided by Clark do **not** provide a surface structure resulting in an integral S (log f) of at least 0.5, as required in the present invention. The integrals achieved with the surfaces according to Clark ranged from 0.017 to 0.134 and are thus three times smaller than the value of the integrals claimed. Accordingly, the structure of the surfaces generated according to Clark are significantly different from the structure of the surfaces of the present invention, even though the structures of Clark have comparable water contact angles.

4. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

5. Further deponent saith not.

Signature

Sept 23, 2004
Date

Table 1

example	height / µm	tip diameter / nm	number of elements	area / µm²	area number density / µm⁻²	Equilibrium water contact angle / °	integral
1 calculation I	1,5 1,5	~ 250 [1] 250	36	4,76	7,5 7,6	171 [6]	0,055
7 calculation 7	1 ... 3 1,0	200 [2] 200	36	12,04	3 3,0	173 [5]	0,066
8 calculation 8	~ 1,3 1,3	130 130	36	4,93	8,5 [3] 7,3	173 [4]	0,134
10 calculation 10-1 calculation 10-2	0,7 0,7 0,7	130 ... 230 141 220	36 25	5,9 1,19	~8 ... ~20 6,1 21	176	0,066 0,017

comments

1) denoted as "diameter of crowns"

2) denoted as "mean tip diameter"

3) given as "approximately"

4) taken from Fig. 6 in 5,674,592, advancing contact angle = receeding contact angle = 173°, no data are given within the text, no equilibrium contact angle is given

5) taken from Fig. 5 in 5,674,592, advancing contact angle = receeding contact angle = 173°, no data are given within the text, no equilibrium contact angle is given

6) no equilibrium contact angle is given, advancing contact angle = receeding contact angle = 171°

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